

- (a) providing a trained neural network that is trained by
- i) using a training data set comprising members that correspond to at least one genetic mutation that correlate to a phenotypic change that cause a change in resistance of the pathogen to at least one therapeutic agent,
  - ii) propagating a training data set in a feed-forward fashion,
  - iii) calculating the associated error,
  - iv) back propagating the error,
  - v) adjusting the weights in the neural network,
  - vi) minimizing the error function by repeating steps ii), iii), iv), v),
  - vii) using a testing data set to ensure proper training, said testing data set comprising members that correspond to at least one genetic mutation that correlate to a phenotypic change that cause a change in resistance of the pathogen to at least one therapeutic agent, which testing data set is different from the training data set;
- (b) providing a determined genetic sequence from the pathogen by
- i) obtaining a sample of said pathogen,
  - ii) obtaining the genetic sequence from the sample; and
- (c) predicting resistance of the pathogen to the therapeutic agent using the determined genetic sequence and the trained neural network.

B2 13. (Twice Amended) A method for predicting resistance of a pathogen to a therapeutic agent comprising:

- (a) providing a neural network;
- (b) training a neural network on a training data set, wherein each member of the training data set corresponds to a genetic mutation that correlates to a phenotypic change that causes a change in therapeutic agent resistance of the pathogen, said training being performed by
  - i) propagating a training data set in a feed-forward fashion,
  - ii) calculating the associated error,
  - iii) back propagating the error,
  - iv) adjusting the weights in the neural network,
  - v) minimizing the error function by repeating steps i), ii), iii), iv),
  - vi) using a testing data set to ensure proper training, said testing data set comprising members that correspond to at least one genetic mutation that correlate to a phenotypic change that cause a change in resistance of the pathogen to at least one therapeutic agent, which testing data set is different from the training data set;
- (c) providing a determined genetic sequence from the pathogen, by
  - i) obtaining a sample from said pathogen,
  - ii) obtaining the genetic sequence from the sample; and

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- (d) predicting resistance of the pathogen to at least one therapeutic agent using the determined genetic sequence and the trained neural network.
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20. (Twice Amended) A trained neural network capable of predicting resistance of a disease to a therapeutic agent, wherein the trained neural network comprises:

- (a) a set of input nodes, wherein each member of the set of input nodes corresponds to a mutation in the genome of the disease;
- (b) optionally a set or more of hidden nodes;
- (c) a set of output nodes, wherein each member of the set of output nodes corresponds to the therapeutic agent used to treat the disease;
- (d) and wherein the trained neural network is trained by
- i) using a training data set comprising members that correspond to at least one genetic mutation that correlate to a phenotypic change that cause a change in resistance of the pathogen to at least one therapeutic agent,
  - ii) propagating a training data set in a feed-forward fashion,
  - iii) calculating the associated error,
  - iv) back propagating the error,
  - v) adjusting the weights in the neural network,
  - vi) minimizing the error function by repeating steps ii), iii), iv), v),

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using a testing data set to ensure proper training, said testing data set comprising members that correspond to at least one genetic mutation that correlate to a phenotypic change that cause a change in resistance of the pathogen to at least one therapeutic agent, which testing data set is different from the training data set.

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